innomia

Facts

Challenge

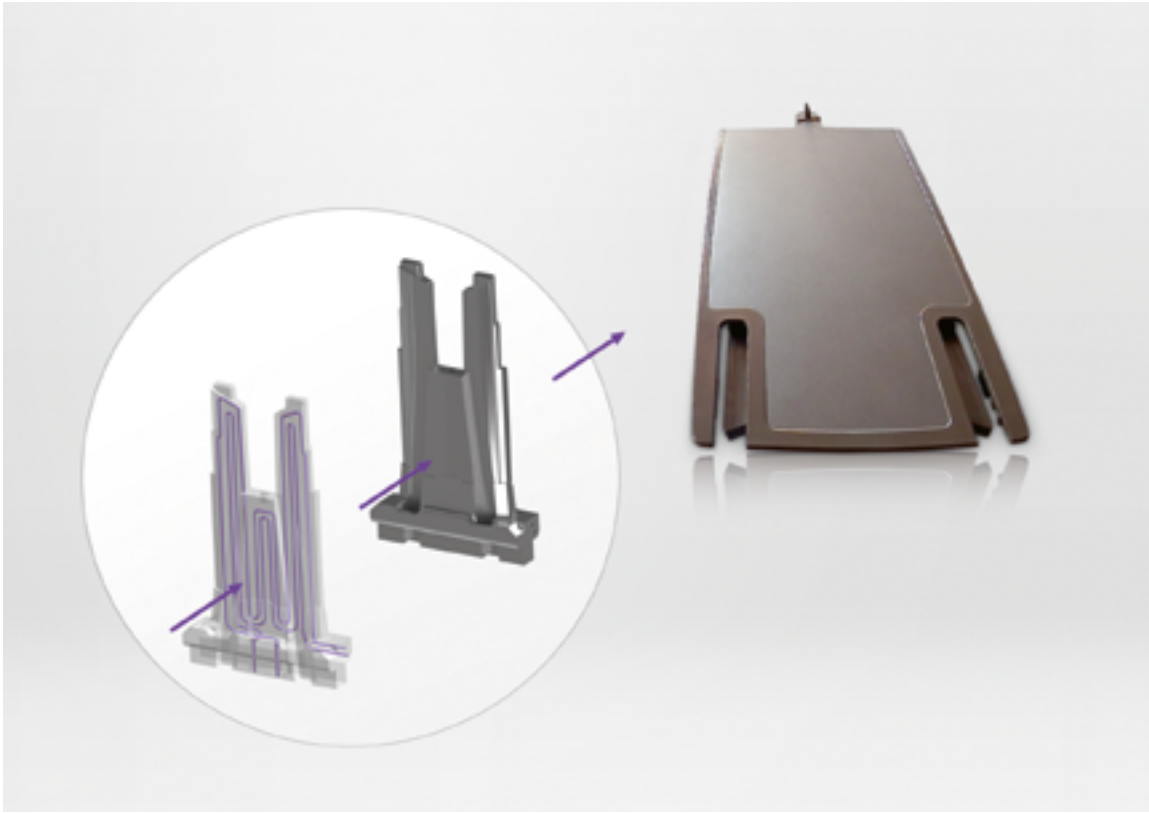
To optimize the cooling process for manufacturing armrests for automobile construction. Reduce the production cycle period, improve component quality and increase maintenance intervals.

Solution

Construction of precision cooling channels in injection mold tool and manufacturing of the optimized core using the EOSINT M 270.

Results

- Reliability: production plant maintenance extended from every two weeks to every five or six
- Quality: uniform cooling prevents deformation of the plastic end product
- Cost reduction: cost are lowered through a 17% cut in cycle times for the plastic injection moldings



Tool insert and injection moulding component: thanks to conformal cooling the cycle time was reduced by 17% and the quality of the armrest part has been improved (Source: Innomia, Magna).

Accelerate Production and Reduce Maintenance: Czech Tool Manufacturer Relies on Additive Manufacturing for Complex Customer Projects

EOS

Innomia Uses EOS Technology for Optimizing Manufacturing Process for Automotive Components

Short profile
Innomia a.s. was founded in 2006. The company's goal is to support and advise customers such as Magna, the Škoda supplier, on the development and manufacture of products, and of metal and plastic prototypes.

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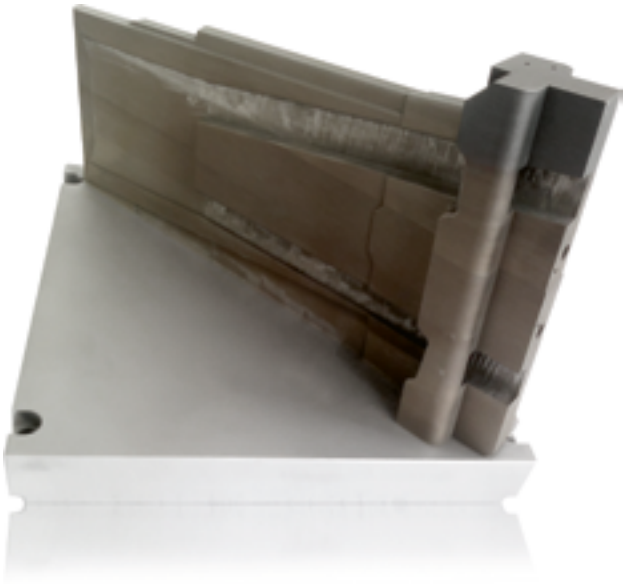
The quality of plastic vehicle components has increased greatly over the last years: complexity, high fitting accuracy, visual appeal and surface feel all meet the constant demand for premium quality – even in many of the high-priced models. Manufacturers and suppliers are relying more and more on high-tech solutions. One of the sectors in which the Czech Republic based company Innomia a.s. is active, is the automotive sector. The company has become a big advocate of the benefits of Direct Metal Laser Sintering (DMLS). Its portfolio spans prototype construction, the manufacture of inserts for injection molds and casting tools, tool repair and more. With the help of EOS technology, the DMLS professionals have supported the automotive supplier Magna in optimizing the production process for injection molded plastic parts. This involved a revision of the cooling process. The case concerns the manufacture of the armrest situated between the front seats.

Challenge
The manufacture of the plastic components for the central armrest is undertaken by the supplier Magna – a customer of Innomia. Production is based on a classic injection molding process. This involves melted plastic filled with glass fibers, injected into the mold cavity and then solidifying. The component can be subsequently removed and is ready for delivery to the automotive manufacturer or to further suppliers in the chain. So much for the simplified version. In reality this is a complex process in which each step must function perfectly.

The heat energy of the liquid base material needs to be dissipated throughout the manufacturing tool to enable the plastic to solidify. The cooling process dictates, amongst other things, the quality of the component. This is because irregular heat dissipation can lead to deformations. Beyond that, temperature control plays a major role in dictating the production cycle time. The quicker the heat is removed, the sooner a component can be extracted and the next one produced.

The tool insert used to date has been made of extremely heat-conducting beryllium-copper alloy and cooling was only possible from one side of the insert. This meant that the temperature distribution was uneven. The cooling water needed to be very cold, just 16 °C, in order to absorb the level of heat energy. Through the high insert surface temperatures – up to 120°C – the humidity rose



Additive manufactured tooling insert on building platform: using EOS technology contributed to an extended maintenance interval and solved the problem of air humidity condensation and potential cavity corrosion completely (Source: Innomia).

in the vicinity, which, in turn, accelerated corrosion. This resulted in a cost intensive cleaning being necessary every one to two weeks. The hardness of the mold core was all that prevented damage of surfaces during the regular cleaning process.

Solution

As a logical consequence, the designers from Innomia began to develop a new tool insert cooling system. The optimized removal of heat generated in the production process was right at the top of the list of priorities. The team decided to go with integrated precision cooling channels, a tried and tested application under DMLS technology, and one of the solutions that only Additive Manufacturing processes can provide. The EOSINT M 270, a system proven over many years, was deployed for Innomia.

The diameter of the cooling channels is just 3 mm. The metal chosen was Maraging Steel 1.2709. The manufacturing process – the layered application and melting of the metal powder corresponding to 3D-data – enabled the employees of the Czech specialists to increase the degree of hardness through post-treatment to over 50 HRC. These mechanical characteristics guarantee a high resistance to wear and thereby reduce the maintenance costs.
"The DMLS process, using the EOSINT M 270, enabled us to manufacture an extremely durable component, while at the same time successfully retaining the proven advantages of the method in terms of design and reduced cycle times," explains Luboš Rozkošný, CEO at Innomia. "Thanks to the cooling channels, integrated in the component with optimum precision, we have resolved the main challenge of the production process, and done so with limited expense."

Results

The precision cooling and the production using Additive Manufacturing technology has had the desired results. The temperature distribution and associated heat dissipation are now substantially more homogenized. Since the heat is distributed and leaves both the tool and the component quicker, a water temperature of 60 °C is sufficient for cooling – reducing the energy needed. The insert surface itself does not heat up beyond 90 °C, a fact that further allowed the engineers to resolve the humidity problems in the surrounding area.

Thanks to Innomia and EOS technology, Magna profits from a maintenance interval that is extended to between five and six weeks. The problem of air humidity condensation and potential cavity corrosion was solved completely. The uniform cooling channels work so well that the time required for the production cycle is now 17% lower than before. As a result of the even and fast distribution and dissipation of heat, the components no longer deform. This has a direct and positive influence on the quality and speed of manufacturing. The reduction of the production cycle time and the improved quality of the end product are simultaneous benefits. After 370,000 cycles, Innomia and Magna have further improved the results. In this period the total savings have already reached some 20,000 euros.

Pavel Strnadek, Head of Tool Maintenance at Magna, is very happy with the results: "The issue of cooling was something that we've been trying to deal with for a long time. We knew how animproved product would have to look, but manufacturing it just wasn't possible. Additive Manufacturing allowed us to make the breakthrough. We were able to plan the cooling channels just as we wanted them and then manufacture the mold core correspondingly. The laser fuses the metallic powder layer by layer, so that in effect any form is possible. The result has convinced us at every level. Maintenance, quality of the end product, costs, heat dissipation – it's been the perfect project."

Additive Manufacturing technologies are helping companies to deliver the promise of quality in automobile construction – Magna, a supplier to Škoda, demonstrates this on a daily basis.

"The automobile industry in Europe is subject to stiff competition. This fact naturally has an effect on suppliers such as Magna. That's why it's very important for us to be able to produce to the highest quality standards at the lowest price. With the optimization of our production plant via the improved cooling of our tools, we have created a textbook example of how technology can help increase efficiency. We reduced the maintenance costs for our production plant, optimized the quality of our components and increased the number of production cycles. This enabled us to uphold the promise of quality we made to our client and, at the same time, meet our own high demands regarding cost-effectiveness."

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